REFORMING CONVENTIONAL RISK ASSESSMENT, RISK MANAGEMENT AND RISK-BASED LAND USE PLANNING METHODS AND CONCEPTS TO INCORPORATE TRIBAL CULTURAL INTERESTS AND TREATY-RESERVED RIGHTS

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Abstract or Summary (if the format calls for one)

Risk assessment is increasingly being used as a primary analytical tool in risk-based decision making. It incorporates implicit and explicit values, biases, presumptions and even, due to the specific parametrics selected for analysis, risk management goals themselves. Thus, both the technical methodology and the values basis of risk assessment must be examined for their adequacy in addressing tribal cultural perspectives and the rights and interests of sovereign American Indian Nations. Conventional risk assessment is especially inadequate for assessing unique tribal activity and exposure patterns and risks to tribal cultures, health and identity. Further, the overall risk management framework frequently lacks holistic and coherent goals, as well as a process for ensuring equal access to the decision process. Specific examples are provided that relate to risk-based land use planning and remediation.

Several solutions are presented here, including the comparative risk approach as a basis for evaluating a wide range of risks, evaluation of risks and impacts to the "ecocultural-human landscape," and criteria used by the technical staff of the Confederated Tribes of the Umatilla Indian Reservation of northern Oregon for evaluating potential impacts to sovereignty and environmental, human and cultural health.

I. Introduction

Risk assessment is increasingly being applied to pollution control and remediation decisions, particularly in the context of cost-risk-benefit analysis and land use planning. While there are certain advantages in using such methods to prioritize remedial actions and develop risk reduction strategies, conventional assessment methods and decision processes are plagued by inherent limitations in their ability to incorporate unique cultural perspectives and the rights and interests of affected communities, particularly those of sovereign American Indian Nations. Credible, technically defensible and politically acceptable risk management strategies will result only if reformed risk assessment practices and open risk management processes fully embrace the perspectives and values of communities directly affected by such decisions[1].

The issues described below have been identified as particular concerns to the technical staff of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR, 1993a, 1993b, 1994a, 1994b, 1995) but are likely to be applicable to many other community situations. Risk assessment increasingly comprises the principal technical decision tool for federal agency decisions about off-reservation activities that may have critical implications or impacts both on-reservation and in off-reservation ceded lands where tribes have sovereign rights reserved to them to use resources and pursue traditional activities. Major federal facilities within tribal ceded lands include the Hanford Nuclear Site in southeastern Washington (the most severely contaminated site in the Western hemisphere), and the Umatilla Army Depot in northeastern Oregon (site of 12% of the nation's chemical and nerve agents stored under deteriorating conditions and slated for onsite incineration). The tribal reservation is downwind and downriver from both these facilities, putting at further risk the resources that tribal people have depended on for thousands of years.

Several major areas of deficiency have been identified in the overall Risk Assessment/Risk Management process: 1) lack of recognition of the range of risk information needed to provide a strong decisional information base, 2) growing recognition that conventional methods and metrics do not provide adequate details about impacts to tribal health, including ecocultural impacts and temporal descriptors, 3) the need for a higher integrative perspective for combining diverse types of risk information into a format useful for both stakeholders and risk managers, and 4) growing recognition

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[1] This raises the point that western science and indigenous science often have different criteria (rules of evidence, or ways of knowing) for establishing the validity of knowledge (Stoffel and Evans, 1990), especially for impacts to tribal ecocultural-human health. Risk assessment is exceptionally vulnerable to this conflict because it is inherently predictive, untestable, and value-laden. Technical "experts" are often allowed to validate both the methods and the results while those who have been risk-assessed are limited to protesting this presumption of validity. Any resulting modifications in the methods, however, are likely to improve the accuracy of conventional (i.e. "approved") approaches by including factors that were heretofore overlooked.

that personal values and (un)recognized biases of the assessor and manager are implicit or explicit throughout the risk assessment and management process (CTUIR, 1995).

Conventional risk assessment is typically focused on "environmental safety and health" (ES&H) risks, overlooking much of what is actually at risk. Risks may directly impact not only human health and the environment -- a particular concern to subsistence-dependent tribal families -- but also tribal cultural values, traditional tribal lifestyles, and tribal cultures themselves for many generations to come. These risks are not often accounted for with existing methodologies, thus resulting in decisions which are "unstable" due to an inadequate information base. Impacts beyond ES&H risks are not just "considerations" to be used in risk management activities, and they are definitely different from conventional definitions of "perceived risk;"[2] they are real risks that require an analysis that is just as rigorous and systematic as that for ES&H risks, and that belong in the same quantitative risk framework (National Research Council, 1994; Vermont Agency of Natural Resources, 1991; California Environmental Protection Agency, 1994).

There is also a more basic deficiency in the entire Western approach to environmental management, and this is also seen in toxics risk assessment and management. An indigenous worldview would seldom rely first or solely on a risk-based approach to either toxics management or land use planning without first committing to principles such as sovereignty, protection, equity and sustainability. In other words, the entire decision context must be framed using the worldview (especially views about sustainability, balance, cyclical time and reciprocal relations) of the indigenous community, because it is logically inappropriate to use a Western context for evaluating impacts to Indigenous values and cultures (Margolis, 1987; Duran and Duran, 1995; LaDuke, 1995).

Several solutions are presented in this paper, and include suggestions for setting values-based integrated ecocultural risk management goals (particularly for complex remedial sites with multiple risk sources and multiple trustee resources), for re-defining the risk information needs to include appropriate culture-specific parametrics, and for using concrete but holistic evaluation criteria as "systems requirements." Whether the decision involves holistic conservation or prioritization ("cultural triage," Stoffle and Evans, 1990), these solutions should be useful.

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[2] Conventional risk approaches tend to evaluate "human health, environmental impacts and perception," or "hazard (i.e. real risks) and outrage (i.e. unreal risks)," or " cancer risk, ecological toxicity and knowledge/dread" (see for example Morgan et al., 1994), or "human health, habitat disruption and the social response to perceived risks" (see OSTP, 1995). None of these approaches evaluates cultural risk correctly, because an evaluation of cultural risk bears little if any resemblance to an evaluation of potential health symptoms due to anxiety and fear which may arise, in part, from recognition of danger (even though neurophysiological symptoms are very real health effects and should be included in the portion of the analysis that addresses direct health risks).

Potential Tribal Risk Model Characteristics

1. Sovereignty and Treaty-Reserved Rights: CTUIR has sovereign authority to, among other things, protect treaty-reserved rights and to promote and enhance tribal self-determination and cultural integrity, and to protect tribal and individual rights to pursue traditional activities, including religious and cultural practices, both on-reservation and in off-reservation ceded areas and beyond.

2. Tribal, state and federal governments, and their natural and cultural resource agencies, are responsible for protecting conditions and resources required for the above practices. Co-management and co-decision making by Sovereign Nations and other Trustees is an absolute requirement for technically defensible and politically acceptable decisions.

3. The fundamental goal of strategic land use planning should be long-term, culturally appropriate Integrated Eco-Cultural Management. The fundamental principles of such plans are sovereignty, protection, equity and sustainability.

4. Types of information that must form the risk information base *after* a principle-based mission plan is developed:
   a. Environmental/Ecological integrity and quality
   b. Human health effects (including multigenerations)
   c. Individual and community Sociocultural/religious well-being
   d. Temporal and spatial descriptors for each of the above.

II. Deficiencies in Conventional Risk Based Decision Making from a Tribal Perspective

Especially if a "course of action" at complex waste sites is composed of hundreds or thousands of individual decisions about risk, cost and schedule, it is important to develop (and enforce) a set of risk principles that reflect the perspectives of the impacted communities. However, decision rules alone do not guarantee adequate participation of sovereign nations, nor do they guarantee that tribal perspectives are understood, much less used in the decision process. A truly open process will ensure that "interested and affected parties" are involved throughout the decision process, and that their values, perspectives, rights and goals frame and guide the decision process from policy development, through problem formulation to decision implementation. It will necessarily shift some of the decision authority to tribal councils or other Trustees/stakeholders and will require some initial investment of time and effort on the part of the responsible agencies to establish an open co-management process. However, this will ultimately be

more cost effective over the long term than approaches such as "decide-announce-defend," "repond-to-comments," or "develop a utilitarian equation and let the computer optimize" (the "science tells us that..." approach).

A. Risk management goals of achieving affordable, acceptable or allowable risk levels may not satisfy principles of equity, protection, or sustainability.

Risk management goals and risk assessment assumptions generally reflect the perspective of the decision maker or risk manager. Risk Management goals (e.g. achieving "acceptable risk," "allowable risk," or "affordable risk") are inherently value-based but are seldom developed democratically. A given level of risk may not be acceptable to stakeholders but may be "allowable" under some statutes or "affordable" under others. Frequently the terminology used to set risk management goals is confused, thus, for example, mistakenly equating safety or protection with available budget.

The basic problem statement of a decision process is often too narrow, and a coherent goal or mission plan is often lacking. It may not be clear whether the goal is to be health-protective, cost-effective, or utilitarian (health-per-dollar-effective). This type of confusion may lead to questions such as "How little do I have to clean?" (also stated as "Don't clean up what doesn't make sense"), or "What level of protection can I afford?" A narrowly focused risk manager may attempt to force a decision into a simplistic zero-sum format (for example, "More expensive remediation or less land use?"). This immediately creates competition among potential land users, especially between industrial users (who may tolerate "brownfield" cleanup standards) and prior-in-time-and-right users such as sovereign Indian Nations for whom the land and its resources are supposed to be held in trust by the U.S. government for members to safely use "for as long as the grass should grow."

Risk management methods of "trading" one type of impact for another are also contrary to indigenous worldviews, because people and their culture are, in reality, inextricably intertwined with the natural environment (Figure 1), with no component being of greater or lesser intrinsic value than any other component. Failure to recognize this cultural dichotomy has resulted in a long history of paternalistic policies on the part of government and technology, and paternalistic actions on the part of professional "experts" (Lowrance, 1985).

B. Ethical, legal, social issues are required parts of the information and planning base, not just a final clearance step, or part of post-decisional stakeholder acceptability.

Values should guide the development of the overall problem statement, the selection of metrics, the collection, analysis and integration of data, the construction of the information base, the selection of decision criteria, and the ultimate implementation of

the decision. The evaluation of ecological and cultural risks is not a step to be postponed until the action is ready to be deployed in the field, because their evaluation encompasses much more than merely avoiding further harm (or minimizing future harm) to localized natural or cultural resources during implementation. This process actually begins with a values-based analysis of the available alternatives that will accomplish the mutually agreed upon goals. If protection of natural and cultural resources is perceived by managers solely as an end-of-process filter, this may result in, at best, project delay and stakeholder outrage, and, at worst, project abandonment. Rather, the original mission statement should, at a minimum, include specific goals related to the ethical and sociocultural issues that will ultimately determine the degree of acceptability of the decision. This is particularly true when so many factors that affect "health" lie outside conventional Euro-industrial medical boundaries (Lowrance, 1985) and exert a strong political or interpretive influence regardless of the weight of the technical evidence.

C. Particularly as risk results are presented as point estimates within risk ranges, uncertainty must also be managed.

Technical uncertainty is sometimes considered analagous to stakeholder perception. The assessor typically addresses technical uncertainty by collecting more data, while the manager seeks to reduce the amount of perceived risk with more communication or education. Both data and communication are thought of as improving the accuracy of the risk estimates, but this is not entirely true for either case. The collection of more detailed data within the original restricted categories is less important than collecting the appropriate breadth of data at proper precision levels. Similarly, the education of risk assessors and managers about cross-cultural perspectives and about the need to modify "approved" risk assessment methods and presumptive risk management goals may be more difficult than ensuring that a community group (or its experts) has a sufficient level of technical understanding to participate meaningfully in the decision process (Silbergeld, 1991; Shrader-Freschette, 1991).

D. Principles of Environmental Justice require changes in the fundamental goals of Risk Based Decision Making and the practice of risk assessment.

At least four factors tend to disproportionately increase risk to American Indian health from environmental contamination: 1) Dose (potentially increased exposure due to cultural lifestyle activities), 2) Response (potentially increased physiologic sensitivity due to genetic makeup, existing health conditions or concurrent exposures), 3) Mitigation (possible decreased access to health care, insurance compensation and other forms of post-harm amelioration), and 4) Cultural Health (potentially disproportionate impacts to individual and tribal community health and identity, and cultural values). In addition, the responsibility of the present generation toward future generations (regarding long term impacts of long-lived radioactive contaminants, for example) requires a description of the

temporal risk profile and an evaluation of multigeneration and cumulative impacts. Conventional risk assessment addresses none of these systematically.

III. Specific Deficiencies in evaluating impacts to tribal health & identity.

Narrowly scoped risk analysis methods tend to omit metrics related to unique use of treaty-reserved resources, unique (non-surburban) lifestyle activities and exposure pathways, and eco/cultural health and tribal identity. Omission of a data integration step and a description of the temporal risk profile may be compounded by other faulty assumptions to further distort the risk picture. Without correcting these deficiencies, it is not possible to evaluate the potential for a disproportionate burden of risks to fall on tribal communities through time. However, if these (and other) deficiencies are corrected, then risk assessment can indeed be one useful tool for risk management, but only after overall integrated, holistic goals and value-based decision criteria are established.

A. Unique use of treaty-reserved resources for subsistence, ceremonial, cultural or religious practices must be evaluated with tribal guidance.

Tribal members use numerous sources of food and other ceremonial, medicinal and material resources that are not commonly used by the dominant society, and are thus ignored in conventional risk assessments. Given the close relationship between nature and tribal people and their culture, a complete understanding of contaminant exposure could only be obtained by charting whole ecosystems, as well as the cultural practices related to gathering and using many resources. Consideration of dietary factors alone includes a myriad of non-suburban plants and animals (along with a variety of plant and animal parts not part of the suburban diet), seasonally fluctuating consumption rates that would cause peaks in contaminant intake rates, a variety of storage and preparation methods, and a higher proportion of locally-obtained food than typical default exposure factors (EPA, 1989) used in conventional assessments.

Further, many species serve multiple purposes (food, medicines and materials). For example, the common cattail has many uses: in the spring the shoots are eaten, the roots are consumed, and the pollen is used in breads later in the season. The fibrous stalks are used in woven items such as baskets in which other foods may be stored or cooked, or mats used for sleeping and shelter (Harris, 1993, 1995). Thus, even describing multiple food uses does not necessarily describe all the ways people interact with even a single species. Further, even if it were possible (and only with tribal permission) to compile a catalog of dietary and medicinal species, biouptake and bioaccumulation factors are largely unknown for individual species. A more appropriate approach may be to start

with an assumption that a given proportion (higher than the standard suburban default assumptions; EPA, 1989) of the total diet is obtained locally, and then to "anchor" the assessment with key species for which contaminant uptake, contaminant bioaccumulation, foodchain transfer and human ingestion rates are known.

In addition to the evaluation of direct and indirect foodchain exposures, part of an impact evaluation must include consideration of the loss of the traditional diet (including protein, vitamins, fiber and so on) which is physiologically optimal for the people who have undergone millenia of genetic adaptation.

B. Unique (non-suburban) lifestyle activities and exposure pathways can only be assessed in direct consultation with local tribes.

Cultural practices that are integral components of a traditional lifestyle may also result in increased exposure potential. Certain cultural, ceremonial and spiritual practices, such as sweat lodges, are unique to tribal people, and present multiple exposure pathways not addressed by conventional risk analyses. In addition, conventional parameters (such as the duration and frequency of time spent outdoors) may need to be increased to account for particular lifestyle practices. Again, a preferred approach begins with a recognition that exposure assumptions should be increased over suburban default levels, rather than attempting to catalog the myriad of individual, confidential and tribal- or clan-specific activities. Activity patterns and therefore exposures may also differ substantially with age and gender, making it important to anchor generic parameters with local knowledge chosen by tribal members to represent particular lifestyles or activities of critical importance.[3]

C. Evaluations of Eco/Cultural health and cultural and spiritual values are core elements in the tribal risk information base.

The term "cultural risk" has been used in at least three ways. In the narrowest sense, it means risk to cultural and historic sites and resources. It may also include traditional activities and skills or knowledge, although this interpretation varies among applications. There are, in fact, significant issues relating to the exact definition of a "cultural resource" or "traditional cultural property" and exactly what constitutes an adverse effect (physical, chemical/radiological, and/or aesthetic). In a broader sense, cultural risk also

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[3] As with specific exposure data, it should be recognized that all resulting information belongs to the affected tribe, and can only be developed and used under their direction; the data do not belong to the assessor or ethnographer. At some point, too, it becomes ethically improper to pursue scholarly inquiry to the point of intrusion (Toelken, 1995), especially if the degree of improvement in "data quality" does not provide a comensurate benefit to the people whose lifestyles are being publicly examined, possibly without their full knowledge or informed consent. In this context, "benefit" does not mean increased "accuracy" in toxicity/exposure data and, as a consequence, relaxed pollution controls and increased allowable exposure levels, but rather some real increase in protection or the provision of health services (using the broadest definition of health).

includes impacts to cultural values and to cultures themselves, and is similar to definitions used in Comparative Risk projects. In some assessments, cultural risk is misused to mean culture-specific social and behavioral response to risk - this reflects a perceptually limited understanding of non-EuroAmerican cultures (i.e. sociological imperialism, Duran and Duran, 1995) that perpetuates cross-cultural communication problems, paternalism, and can even exacerbate adverse effects on tribal health.

Traditional tribal cultural practices evolved over long-term, sustainable associations between human and non-human species and their environment. The environmental landscape shapes modes of thinking, feeling and behaving in a way that goes beyond mere survival. Language, culture and religious symbols all coalesce together at particular locations in forms that reflect the unique local patterns of the naturospiritual realm. The people respond with a corresponding social organization and living religion that are unique to the area and inseparable from it, and that follow the area's natural rhythms and demands. This not only provides a time-proven effective design for sustainable survival, but also represents a way of knowing that reinforces a feeling of real presence in the environment and a continual awareness of the harmonious coexistence of the material and spiritual realms that Euroamericans seldom achieve (Jahner, 1989; Bennett, 1993).

Tribal identity includes culture, religion and place; if the link between the environment and the people is broken, the culture-religion is also broken (Figure 2). Tribal health includes personal well-being that derives from membership in a healthy community with strong traditional values and the ability to follow traditional lifestyle, healing, religious and educational practices in nondegraded surroundings. Since tribal culture-religion is inseparable from the place of origin, full and safe access to these places and their natural resources is required so that the cultural values of critical significance to the American Indian and her/his local community are preserved (Harris, 1995).

D. Faulty land use assumptions in the mental model bias the outcome.

Land use and exposure assumptions can bias the outcome of the risk assessment tremendously. For instance, the (highly questionable) presumption that institutional controls and restricted access will be enforced for as long as contamination remains (thereby preventing exposure and risk) precludes the use of typical residential exposure scenarios and the evaluation of subsistence or other cultural-based activities, and would likely lead to incorrect measures for evaluating progress in risk reduction. For instance, one might declare a site "safe for unrestricted surficial recreational use" while actually leaving in place a substantial amount of surface, subsurface and groundwater and/or surface water contamination that could pose ecological and cultural risks and could also pose unacceptable human risk under reasonable tribal use scenarios, particularly over long time periods.

Using a conventional narrow risk definition as justification for institutional controls, one could conclude that there is indeed no risk if there is no exposure. However, using the broader concept of risk, it is clear that such "mitigation" (i.e. breaking the exposure pathway) also breaks the land-connected culture pathway, which is both an immediate and a cumulative adverse effect on sovereign rights and the ability to safely follow traditional cultural practices. Risk managers may assume that this effect represents a zero-impact planning baseline, or that it is an "affordable" impact compared to other impacts, or even that preventing exposure by forbidding access to heritage lands provides a "net benefit." Similar arguments have been applied to natural resources (e.g. that contamination and restricted access may "protect" habitat from physical disturbance) and cultural resources (e.g. that contaminated gravesites are "protected" from looting). In at least one case, it has been proposed that "mitigation" of cultural impacts could occur through consultation with tribal members and payment for lost spiritual ceremonies on sites that are targeted for destruction through resource exploitation, to the abhorrence of traditional tribal peoples (Hall, 1994).

IV. Solution: Evaluate impacts to the Eco-Cultural landscape

A. Whether the decision context calls for strategies to prevent, mitigate, protect, remediate or restore, principles of Integrated Eco-Cultural Management still need to be followed.

The basic premise of this approach to strategic planning and impact evaluation is that Integrated Environmental Management must be combined with concepts of cultural landscapes and environmental justice into an Integrated Eco-Cultural Management approach (Figure 3). The spatial dimensions include surface and subsurface ground, groundwater and surface water, and air and biota; due to influences from and on nearby geologic and natural features, these boundaries may extend beyond reservation, ceded or traditional use boundaries. The temporal dimension includes cumulative past effects, present impacts (including future impacts deriving from present conditions), future impacts and cumulative multigeneration effects. The ethical dimension may extend far beyond minimal legal requirements for trust resource protection and intergovernmental consultation.

Land-based decisions begin with a rigorous characterization of land and its cultural and natural resources, and include the evaluation of current and potential impacts by stressors to environmental integrity and to human physical, sociocultural and spiritual health associated with use of those resources. Stressors include physical, radiological or chemical contamination and aesthetic impacts, including byproducts and side effects of actions or responses. With this wider evaluation, a different decision might be reached; for example, preservation or restoration of cultural/religious integrity may, in fact, be a key decision driver, and cleanup standards might be developed for ceremonial quality as well as for human health.

Principle: Temporary solutions to remedial actions may have lower short-term project costs but higher cumulative natural resource and sociocultural compensation costs. Interim and final states of remediation, restoration and disposal must be determined with Trustees during the problem definition stage.

B. A Land Use Plan should focus on Integrated Eco-Cultural Management goals. Non-conflicting risk-based priorities and remediation/restoration goals then can be established for individual risk sources or proposed actions.

If mission statements are phrased in holistic ecocultural terms, then specific goals will be more coherent and integrated, regardless of the specific application. For instance, if the mission is to evaluate either prospective (e.g. under NEPA) or retrospective (e.g. under CERCLA) impacts, then information across the entire span of environmental/ecological/ human/socio-cultural risks would strengthen the information base. If the mission is to design remediation and restoration strategies, then the result would be a long-term integrated approach (some or all of which might be risk-based), rather than piecemeal or project-by-project mitigation. If the mission is to choose among technical options, one would start with an "Alternatives Assessment" (O'Brien, 1994) to reflect the full range of stakeholders' underlying goals and key issues (Keeney, 1992) before developing risk-based standards and selecting a preferred alternative. Finally, if the mission is to develop land use plans, then end state land uses might include risk-based criteria for an equitable and sustainable combination of restored treaty-reserved rights, long-term growth management, conservation/preservation, environmental resource use, economic development, and protection/enhancement of health, safety and quality of life.

Neither "risk reduction" nor "land release" would be primary goals of a land use plan - they are secondary to the primary goal of equitable and sustainable integrated eco-cultural management. Only after value-based management principles have been established should risk-based evaluations (spanning the entire range of risk types) be used to prioritize actions for individual risk sources and to establish remedial and restorative goals relative to overall health-protectiveness and cost-effectiveness.

Principle: In a Land Use planning context (especially for complex sites), it is inappropriate to rely on a risk-based land use approach without first developing an integrated, holistic, principle-based mission statement and site-wide plan. Temporally phased and spatially fragmented cleanup and land release actions should not proceed until comprehensive value-based goals are established. Tribal perspectives start with holistic goals and then move to specific objectives directed toward established goals and endstates; they do not start with fragmented actions that are pieced together to construct some semblance of a whole plan.

V. Solution: Approaches for holistic risk evaluation

A. Comparative Risk Projects.

Several comparative risk projects (USEPA, 1993) have evaluated impacts to quality of life, human health and the environment. In particular, the Vermont (1991), California (1994) and Wisconsin Tribes (USEPA, 1992) projects stand out as examples where community values guided the selection of metrics for evaluating impacts ranging from human and environmental health to socioeconomic factors and aesthetics. The Wisconsin Tribes project modified conventional risk assessment concepts to accomodate unique tribal lifestyles and subsistence activities, overall tribal culture, natural resource use, cultural and religious values and tribal priorities. Even so, the predetermined framework for the analysis perpetuated some of the limitations related to the difficulties in evaluating temporal factors, equitable distribution of risk, and long-term sustainability indicators. However, the Wisconsin Tribes project demonstrates that it is indeed possible to modify conventional parameters and develop additional ones that together provide a much more complete and satisfactory description of risk.

B. Specific examples of ecocultural risk evaluation: map-based and parameter-based.

Two approaches are under development at the Pacific Northwest Laboratory that attempt to accomodate tribal perspectives on human-ecocultural risk. One approach uses GIS data layers relating to a variety of ecological resources (some of which may be threatened and endangered, and some of which are not endangered but are of critical importance to local tribal members) and identified cultural/historical resources. As work proceeds, human health risk "isopleths" using tribally-developed exposure scenarios and modeled contaminant concentrations over time will be added. In addition, a "heritage" map indicating general areas of special importance to Hanford Site Nations may also be developed. The philosophical issue here is that while it is necessary to relate impacts to tribal health, culture and identity directly to the land, it may be improper to attempt to "map" cultural values at all, since any zonation implies a judgement as to relative importance of certain species, or relative sacredness of different areas.

A more conventional approach has been to develop parameters reflecting ecocultural values expressed by local tribes, in addition to others modified from comparative risk projects. This approach also has limitations of being overly numerical and thus losing some of the cultural meaning behind the parameters, of inadvertently biasing the evaluation by the selection and wording of individual parameters, of including too little active participation by tribal staff, and of implying that one can prioritize some values over others. Both the map-based and parameter-based approaches do provide methodological starting points, however, and encourage the use of initial value statements to guide the development of parameters.

VI. Solution: The link between theory and practice - "CTUIR Criteria" applied within geographic, geosphere, biosphere, and ethicsphere boundaries.

The meaningful exercise of tribal treaty rights is entirely dependent on a healthy ecosystem; a right to fish or gather plants is hardly useful if the fish and plants themselves have vanished or become contaminated, or if the resources have been damaged to an extent that further exercise of rights will cause unacceptable injury to the resources (CTUIR, 1993a).

An adequate evaluation of impacts to tribal sovereignty, environmental, cultural and personal health requires a holistic and integrated approach that conventional risk assessment and management lack. As described above, natural resources form the basis of traditional diets, ceremonies, material items, recreation, trade and other cultural activities and practices. All indigenous plants and animals have religious significance to people who practice traditional Indian religion. People, culture and nature evolved together and co-adapted over many millenia; impacts to any one of these affects overall tribal health and identity, because impacts to a single resource may have ramifications for human health, environmental integrity and religious use.

General criteria for evaluating impacts spanning the range of concerns discussed above are shown below. Additional principles can be enumerated for specific proposed actions, such as "do not prejudice future options" through the choice or irretrievable waste forms or through the use of physical barriers between long-lived radioactive or chemical contaminants and the environment that must be replaced every 100 years for the next 10,000 years.

CTUIR Criteria for Evaluating the Impacts of Proposed Actions

1. **Protection of Tribal Sovereignty,** including protection of tribal rights in ceded territory and areas over which CTUIR exercises off-reservation treaty rights in perpetuity.

2. **Protection and Restoration of the Environment,** including the resources required for full and safe exercise of on- and off-reservation treaty rights.

3. **Protection of cultural, religious and archaeological resources,** cultural integrity and heritage, the conditions necessary for traditional, subsistence or religious activities (including aesthetic or spiritual qualities of an area or resource), tribal identity, and related Tribal rights.

4. **Protection of the Reservation and its members,** including future generations, from hazards originating in off-reservation ceded lands or elsewhere.

The spatial and temporal dimensions of such an evaluation may not stop at the boundary of the reservation or ceded territory, but extend for as far distant as the resource (aquifers, habitat, and so on) and its buffer zones extend, and for as far and as long as the impact persists on the land, natural resource, and human base of a whole and holistic community. It includes all environmental media (biotic and abiotic), and all uses, adaptations and effects. It includes considerations of ancillary and cumulative impacts to eco-cultural (including aesthetic) resources related to the exercise of treaty rights in either space or time. Finally, as recognition of a "global village" increases, an American Indian set of environmental ethics is required as the basis of a safe, healthy, equitable and sustainable future for us all.

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Figure 1. The "Double Helix" of Risk Assessment. People and Nature are intimately linked by Culture-Religion, and an evaluation of all three is necessary in order to develop an appropriately comprehensive and holistic an information base relevant to tribal health.

(modified from: Office of Technology Assessment, 1986. "Technologies for Detecting Heritable Mutations in Human Beings." Washington D.C., 1986 (page 24).

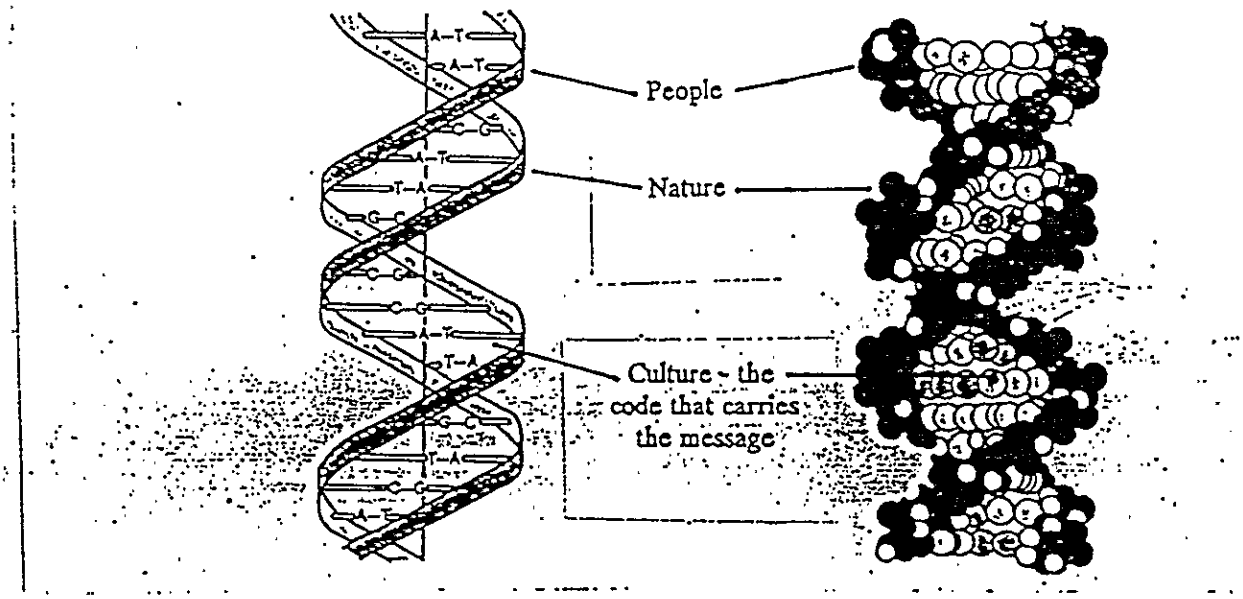

Figure 1

Figure 2. A Creator Paradigm, illustrating why full and safe access to a healthy ecosystem is necessary for tribal cultural-spiritual health. The term "treaties" refers to the various treaties between Indian Nations and the U.S. Government, under which natural and cultural resources necessary for a healthy environment and traditional lifestyle will be protected by the U.S. government in perpetuity for tribal people.

(with thanks to Russell Jim and Robert Cook, Yakama Indian Nation, and Stuart Harris, Confederated Tribes of the Umatilla Indian Reservation).

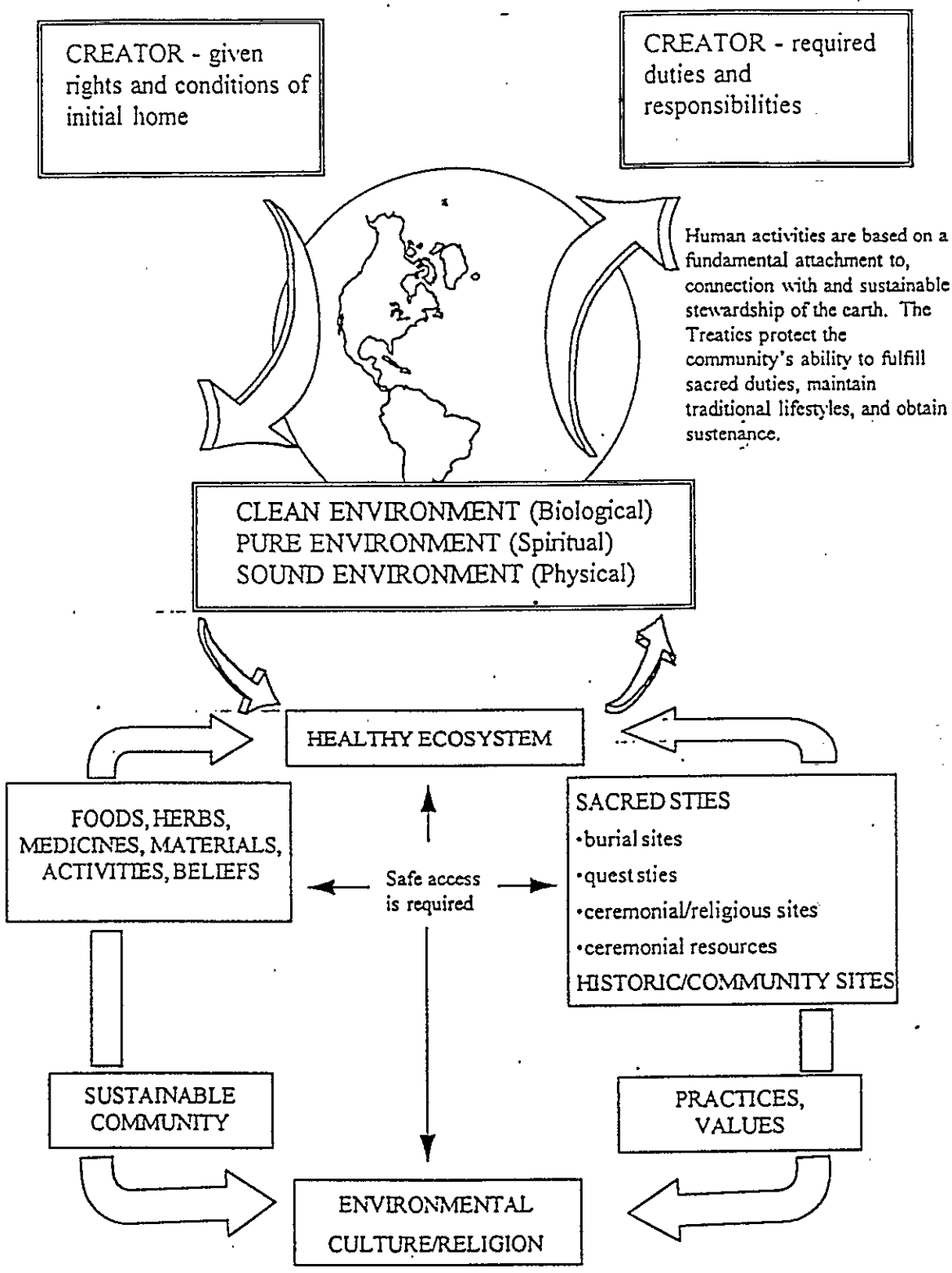
CREATOR - given rights and conditions of initial home
CREATOR - required duties and responsibilities
Human activities are based on a fundamental attachment to, connection with and sustainable stewardship of the earth. The Treaties protect the community's ability to fulfill sacred duties, maintain traditional lifestyles, and obtain sustenance.
CLEAN ENVIRONMENT (Biological)
PURE ENVIRONMENT (Spiritual)
SOUND ENVIRONMENT (Physical)
HEALTHY ECOSYSTEM
FOODS, HERBS, MEDICINES, MATERIALS, ACTIVITIES, BELIEFS
Safe access is required
SACRED STIES
•burial sites
•quest sties
•ceremonial/religious sites
•ceremonial resources
HISTORIC/COMMUNITY SITES
SUSTAINABLE COMMUNITY
PRACTICES, VALUES
ENVIRONMENTAL CULTURE/RELIGION

Figure 3. An Eco-Cultural Management Unit. The shaded areas within the four components of the ecocultural unit indicate that, from a holistic tribal perspective, conventional methods or standards address only a portion of what is "at risk." Environmental impacts that are significant to tribal members may occur even when regulatory standards are not violated; RAGS Superfund guidance (USEPA, 1989) is not appropriate for traditional lifestyles; single-species ecological toxicity does not address habitat and other landscape-scale impacts; a narrow legalistic definition of cultural resources ("stones and bones") does not reflect cultures and cultural values that may be at risk. Note that "severity" and "consequences" are not the same: severity is a (more or less) objective indicator of the level of harm that could occur to a given resource, while consequences measures severity plus the importance (weight) of the affected resource.

BL Harper
5/31/95